Upon the Extent of the Expansion and Contraction of Timber in different directions relative to the Position of the Medulla of the Tree. By Thomas Andrew Knight, *Esq. F.R.S. In a Letter addressed to the Right Hon. Sir* Joseph Banks, *Bart. G.C.B. P.R.S.* Read May 8, 1817. [*Phil. Trans.* 1817, *p.* 269.]

Most of the attempts which have been made by writers on vegetable physiology, to account for the force with which the sap of trees ascends during the spring, having proved unsatisfactory and inadequate, Mr. Knight was induced some years ago to suggest the expansion and contraction of the cellular processes proceeding from the bark to the medulla, and which he called the true or silver grain of the wood, as concerned in this process.

The present paper contains further experiments, showing this power to be active in living trees, and were made on many kinds of timber with nearly similar results. Some boards of ash and beech wood were cut in opposite directions relative to their medulla, so that the convergent cellular processes crossed the surfaces of some of them at right angles, and were parallel with the surfaces of others. These were placed, under similar circumstances, in a warm room, and the former warped about ten times more than the latter, contracting nearly 14 per cent. in breadth, while the others only contracted $3\frac{1}{2}$ per cent. During his experiment Mr. Knight was led to infer that the medullary canal must be liable to considerable changes of diameter, as the moisture of wood increases or diminishes. To ascertain this, parts of the stems of young trees were carefully dried, the medulla was removed, and metal cylinders driven with force into the empty space. The pieces of wood were then suffered to absorb moisture, and the medullary canal became so much enlarged as to suffer the cylinders to fall out.

Mr. Knight conceives that this kind of expansion often produces those rifts in trees referred to wind or frost. That winds cannot be the cause, seems obvious from the circumstance of pollard-oak-trees being almost always rifted, upon which they can have little power; and the frost of this climate is seldom sufficiently intense to congeal the winter sap in trees.

The force with which this cellular substance of timber expands, is more than adequate to such effects, and often overcomes a pressure of many tons; and as it is in action in the living tree, Mr. Knight is of opinion that it is the agent by which the powerful propulsion of the sap observed by Hales is effected.

Observations on the Temperature of the Ocean and Atmosphere, and on the Density of Sea-water, made during a Voyage to Ceylon. In a Letter to Sir Humphry Davy, *LL.D. F.R.S. By* John Davy, *M.D. F.R.S.* Read May 22, 1817. [*Phil. Trans.* 1817, *p.* 275.]

The experiments on the specific gravity of sea-water, detailed in this paper, were partly conducted at sea, and partly after the author's

arrival at Ceylon; and the results lead him to adopt the opinion that the ocean resembles the atmosphere in being, *cæteris paribus*, nearly of the same specific gravity throughout. The water used in the experiment was always taken from the surface of the ocean. The variation of specific gravity was most observable when the water was rough and agitated, and seemed in one instance diminished by heavy rain.

Dr. Davy doubts whether a modern traveller of high authority is correct in supposing that a peculiar specific gravity belongs to the water of each zone; for in his own experiments, the water taken in latitude 0° 12′ S., and 22° 36′ S., was of similar specific gravity, as also that taken at 34° 25′ S., and that washing the shores of Columbo.

The trials of the temperature of the air and water were, during the greater part of the voyage, made every two hours, night and day. The variations of atmospheric temperature, says the author, follow the course of the sun. They are pretty considerable whilst he is above the horizon, and very insignificant during the night. At a great distance from land, and with a steady wind between and bordering upon the tropics, the diurnal variation of atmospheric temperature appeared perfectly regular; its maximum precisely at noon, its minimum towards sunrise. In a calm, the maximum of heat was some time after noon, and the regular law of variation is more obviously interfered with by storms and rain.

The temperature of the sea was found liable to variations nearly as great as those of the incumbent atmosphere. In fine quiet weather, at a great distance from land, the maximum of temperature was about 3 P. M., and the minimum towards sunrise. It is, however, subject to irregularities. In tempestuous weather superficial currents seem to be established in the direction of the prevailing winds, which increase or lower the temperature according as the wind is hot or cold. Where the sea is shallow, its temperature is comparatively low; a fact which may sometimes prove useful in indicating to the mariner the vicinity of shallows. In approaching the Cape of Good Hope and Ceylon, the author had occasion to observe this fact: in the latter case there was a reduction of 2° on coming into soundings. In considering the effects of currents upon the temperature of the sea, Dr. Davy particularly notices that which flows round the bank of Lagullas from the S.E. coast of Africa, and which is 10° above the surrounding sea; a difference partly referable to the banks which border the current. The dense mist which occasionally covers the Table Mountain is considered by Dr. Davy as connected with this current, and produced by the condensation of the vapour rising from this current by a cold S.E. breeze, during which the phenomenon only happens.

This communication concludes with some general and practical inferences connected with the use of the thermometer at sea: it contains several tables of results, and of meteorological observations.